

A MONOGRAPH OF THE FRESHWATER ENTOMOSTRACA OF NEW SOUTH WALES. PART II. COPEPODA.

By MARGUERITE HENRY, B.Sc., Linnean Macleay Fellow of the Society in Zoology.

(Plates Iv.-lviii.)

Introduction.

The Copepoda of New South Wales have not been dealt with as extensively as the Cladocera. In 1855, King mentioned a species of *Cyclops*, *C. australis*, and four species of *Diaptomus*, but gave neither descriptions nor diagrams. The name *C. australis* was retained by Sars for the largest known Australian *Cyclops* but it has been impossible to identify the species of *Diaptomus*, as no members of that genus have been found in the vicinity of Sydney, where King obtained his specimens. The next mention of Copepoda in the State was in 1896, when Sars recorded the presence of nine species, two of which were described as new. In 1919, the present writer recorded five more species, of which three were described as new, and also a new genus *Gladioferens*. The present paper deals with twenty-three species; one is recorded for the first time in Australia, four for the first time in New South Wales and three are described as new.

With the exception of Victoria, comparatively little is known of the Copepods existing in the other States. Sars described eleven species from Victoria in 1908, six of which were new; in 1912, he added three new species and described a new genus *Hemiboeckella*. The work has been ably carried on by Searle who has published three papers, in 1911, 1912 and 1914, in which seven additional new species were described. The total number of species recorded from Victoria was thus raised to twenty-three. In 1889, Sars raised two species of *Diaptomus* from dried mud that had been collected from the Graemere Lagoon, near Rockhampton, Queensland, one species, *D. lumholtzi*, being new. The only other Copepod recorded from Queensland was a new species of *Cyclops* described by Breil in 1911.

The first mention of Copepoda in South Australia was made in 1917 by Chilton, who saw a species of *Boeckella* in Central Australia and recorded the fact, although the species was not identified. The six species here recorded were collected in the Botanic Gardens and in the hills near Adelaide. A species of *Boeckella* occurred in these collections, but as the specimens were all females and were not very numerous an exact determination could not be made.

G. W. Smith, in 1909, described seven species from Tasmania, of which six were new and proposed a new genus, *Brunella*. Dr. Chilton kindly sent the writer a collection of Copepoda from Cradle Mountain, Tasmania, which consisted mainly of specimens of *Boeckella longisetosa* Smith and a few of *Cyclops dulvertonensis* Smith.

Type specimens of the new species described in this paper and in Part I. have been deposited in the Australian Museum, Sydney.

The writer's thanks are due to Miss J. M. Murray, for specimens of South Australian Copepoda; to Mr. T. Whitelegge for many collections from the neighbourhood of Sydney; to Miss K. English for a collection from Yass and to Mrs. Neil Ross for several fine collections from Moss Vale and Holbrook.

The drawings for this paper were all prepared with the aid of a camera lucida; the finished drawings were done by Miss D. Harrison.

The following lists give the Copepoda recorded from all the States.

New South Wales.

CALANOIDA.

Fam. DIAPTOMIDAE.—*Diaptomus orientalis* Brady, *D. graciloides* Lilljeborg.

Fam. CENTROPAGIDAE.—*Boeckella triarticulata* (Thomson), *B. oblonga* Sars, *B. fluvialis*, n.sp., *B. coronaria*, n.sp., *B. minuta* Sars, *B. robusta* Sars, *B. pseudocheles* Searle, *Gladioferens spinosus* Henry, *G. brevicornis* Henry, *Hemiboeckella searli* Sars.

CYCLOPOIDA.

Fam. CYCLOPIDAE.—*Cyclops australis* King, *C. varicans* Sars, *Pachycyclops annulicornis* (Koch), *Leptocyclops agilis* (Koch), *L. viridis* Henry, *Mesocyclops obsoletus* (Koch), *Platycyclops phaleratus* (Koch), *P. affinis* Sars, *P. fimbriatus* (Fischer).

HARPACTICOIDA.

Fam. CANTHOCAMPTIDAE.—*Attheyella australica* Sars, *Moraria longiseta*, n.sp.

Victoria.

CALANOIDA.

Fam. CENTROPAGIDAE.—*Boeckella symmetrica* Sars, *B. oblonga* Sars, *B. asymmetrica* Searle, *B. tenera* Sars, *B. minuta* Sars, *B. pseudocheles* Searle, *B. triarticulata* (Thomson), *B. saycei* Sars, *Brunella viridis* Searle, *Br. longicornis* Searle, *Br. tasmanica* Smith, *Br. australis* Searle, *Br. ampulla* Searle, *Br. expansa* Sars, *Calamoccia australica* Sars, *Hemiboeckella searli* Sars.

CYCLOPOIDA.

Fam. CYCLOPIDAE.—*Cyclops australis* (King), *C. arnaudi* Sars, *Mesocyclops obsoletus* (Koch) var. *australiensis* Sars, *Pachycyclops annulicornis* (Koch), *Leptocyclops agilis* (Koch).

HARPACTICOIDA.

Fam. CANTHOCAMPTIDAE.—*Attheyella australica* Sars.

Queensland.

CALANOIDA.

Fam. DIAPTOMIDAE.—*Diaptomus orientalis* Brady, *D. lumholtzi* Sars.

CYCLOPOIDA.

Fam. CYCLOPIDAE.—*Cyclops pallidus* Breinl.

South Australia.

CALANOIDA.

Fam. CENTROPAGIDAE.—*Boeckella* sp.

CYCLOPOIDA.

Fam. CYCLOPIDAE.—*Cyclops australis* (King), *Pachycyclops annulicornis* (Koch), *Leptocyclops speratus* Lilljeborg.

HARPACTICOIDA.

Fam. CANTHOCAMPTIDAE.—*Attheyella australica* Sars, *Moraria longiseta* Henry.*Tasmania.*

CALANOIDA.

Fam. CENTROPAGIDAE.—*Boeckella robusta* Sars, *B. rubra* Smith, *B. insignis* Smith, *B. longisetosa* Smith, *Brunella tasmanica* Smith.

CYCLOPOIDA.

Fam. CYCLOPIDAE.—*Cyclops albicans* Smith, *C. dulvertonensis* Smith.*Classification.*

The classification of the Copepoda is still in an unsatisfactory condition, mainly because many of the parasitic forms have not been thoroughly worked out. Giesbrecht's scheme of dividing the Eucopepoda into two suborders, Gymnoplea and Podoplea, was discarded by Sars in his Crustacea of Norway, as being artificial, and in dealing with the Copepoda as a whole, he divided it into seven great divisions, while for the Cyclopoidea he revived Thorell's old terms of Gnathostoma, Siphonostoma and Poecilostoma. In dealing exclusively with the free-living forms, Giesbrecht's classification is quite a natural one, his suborder Gymnoplea corresponding with the division Calanoidea of Sars and his Podoplea comprising the Cyclopoidea and Harpacticoida. The following key is based on Giesbrecht's classification.

Key to the Eucopepoda.

- A. Articulation between cephalothorax and abdomen occurring between the 5th and 6th segments suborder *Gymnoplea*
 (= *Calanoidea* Sars.)
- B. Antennules of male not geniculate. (All marine) Tribe *Amphastandria*.
 BB. One antennule geniculate in male. Tribe *Heterarthrandria*.
- AA. Articulation between cephalothorax and abdomen occurring between the 4th and 5th free segments. suborder *Podoplea*.
- B. Swimming forms with antennules not geniculate in the male. (Mainly parasitic). Tribe *Isokerandria*.
 BB. Swimming forms with both antennules geniculate in the male.
 Tribe *Ampharthrandria*.
 (= *Cyclopoidea* Sars and *Harpacticoida* Sars).

The free-living freshwater forms are all comprised in the three divisions *Calanoidea*, *Cyclopoidea* and *Harpacticoida* of Sars, so that the following key is sufficient for identification.

- A. Articulation between the cephalothorax and abdomen occurring between the 5th and 6th free segments. *Calanoidea*.
- AA. Articulation between the cephalothorax and abdomen occurring between the 4th and 5th free segments.
- B. Cephalothorax and abdomen distinctly separated. *Cyclopoidea*.
 BB. No distinct separation *Harpacticoida*.



Division 1. CALANOIDA.

Cephalothorax broader than the abdomen, with which it very movably articulates. Antennules elongated, those of the male transformed, either by a reduction in the number of segments or by the one being geniculated. Antennae biramous, endopodite biarticulate, exopodite multiarticulate. Five pairs of legs, the last of which are prehensile in the male. Single ovisac, when present, attached ventrally to the genital segment. A well-developed heart present. There are three freshwater families, but the majority of the Calanoida are marine.

Key to families of the Calanoida.

- A. 5th pair of legs (♀) natatory. *Centropagidae*.
 AA. 5th pair of legs (♀) not natatory.
 B. Endopodites of 5th legs (♀) absent. *Temoridae*.
 BB. Endopodites of 5th legs (♀) present. *Diaptomidae*.

Family DIAPTOMIDAE.

Abdomen short, composed of 2 or 3 segments in the female and 5 in the male; last segment of the cephalothorax with the lateral parts expanded in the female; caudal rami short. Antennules composed of 25 segments, the right one in the male geniculate. Antennae with the exopodite longer than the endopodite and seven-segmented. First pair of legs with endopodites composed of two segments, those of the next three pairs composed of three segments; fifth pair in the female with small simple endopodites and three-segmented exopodites; fifth pair in the male with the right leg larger than the left and provided with a movable claw. Ovisac present in the female. Two genera are included in this family, one of which is represented in Australia.

Genus DIAPTOMUS Westwood, 1836.

Syn.—*Glaucea* Koch, *Cyclopsina* M.-Edw. (part).

Lateral expansions of last segment of cephalothorax biangular, armed with two small denticles. Abdomen in the female 3-segmented, of which the genital segment is much the largest, second segment very small. First pair of legs with the last joint of the exopodites armed with only one spine outside. One hundred and sixty-two species of this genus have been described, nearly all of which are only represented in the northern hemisphere, its place being taken in the southern by *Boeckella* and allied genera. King mentioned four species of *Diaptomus* in 1855 (*D. pollux*, *D. maria*, *D. cookii* and *D. uxorius*), but no description or figures exist. It is probable that the specimens he referred to belonged to the genus *Boeckella* which is well represented in the vicinity of Sydney, since no species of *Diaptomus* has as yet been found south of Casino, on the north coast of N.S.W. Playfair recorded finding *D. graciloides* in the Richmond River, but some doubt exists as to this being a correct identification. It is therefore only certain that one species of the genus occurs in New South Wales.

DIAPTOMUS ORIENTALIS Brady.

First described by Brady (1885), recorded from Australia by Sars (1889, Plate vii., Figs. 12-16; Plate viii., Figs. 1-4).

Female. Cephalothorax strongly built, tapering anteriorly; lappets of the last segment broadly expanded, their outer corners pointed and their inner corners rounded. Abdomen composed of two segments, the first of which is

elongated and slightly expanded at the base; caudal rami short and broad, somewhat dilated near their tips, their inner edges finely ciliated; the innermost seta of each ramus is very delicate, the other five are large and densely hairy. Antennules composed of twenty-five segments and reaching beyond the first segment of the abdomen. Fifth pair of legs with the second segment of each exopodite produced inwardly to form a slightly curved process, 3rd segment very small, bearing two spines of unequal length; the endopodite, composed of one segment, nearly reaches the end of the first segment of the exopodite. Length, 1.8 mm.

Male. Similar to the female in shape, except that the caudal rami are slightly narrower. Right antennule very swollen in the middle portion. In the fifth pair of legs, the right leg has a small one-segmented endopodite and a two-segmented exopodite, the terminal segment of the latter bearing a short spine and a curved apical one; left leg with its exopodite bearing two digitiform processes and a rounded ciliated lamella. Length, 1.5 mm.

Distribution.—N.S.W.: Casino; Queensland; Ceylon; Natal.

Family CENTROPAGIDAE.

Caudal rami more or less elongated, bearing the full number of setae. Antennules in the female composed of 24 or 25 segments; right antennule in the male geniculate. Four first pairs of legs with both rami 3-segmented; fifth pair in the female biramous, natatory; in the male the exopodites transformed and dissimilar, the right leg being the stronger. Five genera of this family are represented in Australia but only three of them are known to occur in New South Wales.

Key to the genera of Centropagidae.

- A. Natatory legs with the number of segments in the endopodites reduced.
 - B. Endopodites of the first pair of legs one-segmented. *Brunella*.
 - BB. Endopodites of first pair two-segmented. *Calamoecia*.
- AA. Natatory legs with the endopodites three-segmented.
 - B. 4th pair of legs in the female with a long spine on the inner edge of the basal segment. *Gladiofeiens*.
 - BE. No such spine.
 - C. 5th pair of legs in the male with the exopodite of the left leg prehensile, ending in a long claw. *Boeckella*.
 - CC. Exopodite of the left leg scarcely prehensile, bearing a simple spine at the tip. *Hemiboeckella*.

Genus *BOECKELLA* De Guerne and Richard, 1889.

Syn.—*Boeckia* Thomson, 1882.

Last segment of the cephalothorax greatly produced laterally. Abdomen composed of five segments in the male, three in the female; caudal rami short. Five pairs of legs in the female, all natatory, and with both rami three-segmented; fifth pair with the second joint of the endopodite produced inside; fifth pair in the male very powerful, each leg terminating in a long movable claw, the endopodites rudimentary. About twenty-seven species are known and, with the exception of *Boeckella orientalis* Sars, which occurs in Central Asia, they are all confined to the southern hemisphere; seven species are found in New South Wales.

Key to species of Boeckella.

- A. Basal segment of the left leg of the 5th pair in the male bearing a serrated lamella.
- B. Endopodite of the right leg of 5th pair in male, without an inward projection. *triariculata*.
- BB. Endopodite with an inward projection.
- C. Endopodite of the left leg two-segmented. *fluvialis*.
- CC. Endopodite of the left leg one-segmented.
- D. Serrated lamella of the basal segment with a pointed projection. *coronaria*.
- DD. No such projection. *oblonga*.
- AA. Basal segment of the left leg of the 5th pair in the male without a serrated lamella.
- B. Terminal segment of the exopodite of the 5th pair of legs in the female bearing only two spines. *minuta*.
- BB. Terminal segment bearing seven spines.
- C. Endopodite of the right leg of the 5th pair, male, does not reach the end of the second segment of the exopodite and bears a curved bristle at the base. *robusta*.
- CC. Endopodite reaches considerably beyond the second segment of the exopodite and has an inward projection at the base. *pseudocheles*.

BOECKELLA TRIARTICULATA (Thomson).

Described by Thomson (1882) as *Boeckia triarticulata*; first recorded from N.S.W. by Sars in 1896 and from Victoria in 1908 (Plate 1, figs. 1-4).

Female. Cephalothorax moderately slender, tapering slightly anteriorly; last segment expanded laterally into two bilobed lappets, the outer lobes of which extend beyond the first segment of the abdomen, the inner lobes are twisted and pointed at the tips. Abdomen about half the length of the cephalothorax; genital segment asymmetrically dilated at the base, being more swollen on the right side than on the left; caudal rami slightly longer than the last segment, widening towards the tips. Antennules comparatively short, extending, when reflexed, to the end of the second segment of the urosome. Fifth pair of legs with the endopodites extending beyond the second segments of the exopodites; the terminal segments of the latter bearing seven spines. Length, 2.5 mm.

Male. Smaller than the female. Right antennule geniculated. Fifth pair of legs with the second basal segment of the left leg provided on its inner side with a prominent triangular-shaped lamella, with a serrated edge; endopodite small and simple, reaching about half the length of the first segment of the exopodite. Right leg with a longer endopodite that almost reaches the end of the second segment of the exopodite and bears a small denticle at the tip; terminal claw equal to the length of the exopodite itself, the two other spines of equal size.

Distribution.—N.S.W.: Rarely found in the neighbourhood of Sydney; Victoria; New Zealand.

BOECKELLA OBLONGA Sars.

Sars, Arch. Math. og Naturvid., xxix., 1908, Plate 1, figs. 5-8.

Female. Cephalothorax narrower than in the preceding species, tapering slightly anteriorly and posteriorly; the lateral expansions of the last segment small, the outer lobes reaching the middle of the first abdominal segment, inner lobes straight and pointed. Genital segment of the abdomen asymmetrical, comparatively longer than in the preceding species and not so much dilated at

the base. Antennules extending to the base of the caudal rami. Fifth pair of legs very similar to those of the preceding species. Length, 2.0 mm.

Male. Fifth pair of legs with the serrate lamella of the left leg smaller than in *B. triarticulata* and curved at the tip; right leg with the endopodite reaching the end of the second segment of the exopodite and having a well-defined, inwardly-directed projection near the base; the spine of the first segment of the exopodite is only half the length of that of the second segment; the terminal spine greatly exceeds the length of the ramus.

Distribution.—N.S.W.: This species has not hitherto been recorded from this State; it was collected on several occasions at Moss Vale. Sars' specimens came from Victoria.

BOECKELLA FLUVIALIS, n.sp. (Plate lvi., figs. 1-2 and 4-6.)

Female. (Pl. lvi., fig. 1). Cephalothorax long and slender, oval in outline, tapering slightly anteriorly; last segment with the lateral expansions (Pl. lvi., fig. 2) large, the outer lobe acutely pointed and extending to the end of the first segment of the abdomen, inner lobe small and rounded, with a short pointed projection in the middle. Abdomen with a long genital segment which is equal to the two succeeding segments combined; it is very slightly asymmetrical and moderately protuberant ventrally; caudal rami not divergent, exceeding the length of the preceding segment and bearing well-developed setae which are of almost equal length. Antennules long, reaching, when reflexed, almost to the end of the caudal setae. Antennae and oral parts of normal structure. Fifth pair of legs moderately strong, the second segment of the exopodite provided with the usual curved and denticulated claw, last segment of this ramus bearing seven spines, the inner apical one of which is exceptionally long, exceeding the length of the segment itself. Length, 1.8 mm.

Male. Similar in appearance to the female, but without the pointed lateral expansions of the last segment of the cephalothorax. Right antennule (Pl. lvi., fig. 6) moderately swollen and geniculated. Fifth pair of legs powerfully developed; the left leg (Pl. lvi., fig. 4) has a large rectangular-shaped lamella on the second basal segment; this lamella is irregularly serrated, the first and the last prominences being the largest. The endopodite is composed of two distinct segments; it is unarmed and has a rounded apex; the inner edge of the first segment of the exopodite is slightly curved towards the endopodite and bears numerous hairs. The second basal segment of the right leg (Pl. lvi., fig. 5) is produced inwardly to a pointed, somewhat triangular expansion; the endopodite reaches the end of the second segment of the exopodite, tapering irregularly to a point; the base is produced inwards to form a second triangular expansion which is broader than that of the basal segment; the spine of the first segment of the exopodite is equal in length to two-thirds of that of the second segment. Length, 1.7 mm.

This species is most nearly allied to *B. triarticulata* (Thomson) and *B. oblonga* Sars. It differs specifically from both these species, more especially in the length of the antennules and the formation of the fifth pair of legs in the male.

Distribution.—N.S.W.: Holbrook.

BOECKELLA CORONARIA, n.sp. (Plate lv., figs. 1-7.)

Female (Pl. lv., fig. 1). Cephalothorax long and slender, tapering anteriorly and posteriorly, the greatest width occurring about the middle; lateral expansions of the last segment of moderate size, the outer lobe extending beyond the middle

of the first abdominal segment, inner lobe also acute. First segment of the abdomen exceeds the combined length of the two succeeding segments; it is very slightly dilated at the base and quite symmetrical; caudal rami longer than the last abdominal segment; caudal setae strongly developed. Antennules (Pl. lv., fig. 4) extending, when reflexed, to the middle of the caudal rami. Fifth pair of legs of normal structure, the terminal segment of the exopodite (Pl. lv., fig. 3) bearing seven comparatively short spines. Length, 1.5 mm.

Male. Right antennule (Pl. lv., fig. 7) less swollen than is usual in the genus, distinctly geniculated. Fifth pair of legs most nearly resembles that of *B. oblonga*; in the left leg (Pl. lv., fig. 6) the second basal segment bears a serrated lamella which is armed with several small denticles and terminates in a claw-like projection which also bears denticles; this projection is distinctly separated from the remainder of the lamella; endopodite of irregular shape, extending more than half the length of the first segment of the exopodite; the right leg (Pl. lv., fig. 5) has an inward projection on the endopodite as in *B. oblonga*, though it is of different shape and the endopodite itself does not terminate in a fine point as in that species but has an indentation in its otherwise rounded apex; the endopodite reaches the end of the second segment of the exopodite; the exopodite bears a terminal curved claw which is longer than the ramus, its other two spines are nearly equal in length. Length, 1.3 mm.

Note.—This species was reared from a sample of dried mud, and both males and females were plentiful in the aquarium; they were transparent, but the egg sacs were usually tinged with salmon pink.

Distribution.—N.S.W.: Corona (north of Broken Hill).

BOECKELLA MINUTA SAWS.

Sars, Arch. Math. og Naturvid., 18, 1896, Plate 8, figs. 5-7.

Female. Cephalothorax elongated, slender, narrowing anteriorly; last segment expanded laterally into two bilobed lappets, outer lobe narrow and pointed, reaching beyond the middle of the first abdominal segment, inner lobe small and triangular. Abdomen slender, genital segment asymmetrical, longer than the next two segments combined; caudal rami longer than the last segment of the abdomen, but not as long as the last two segments combined. Antennules long, extending, when reflexed, beyond the caudal rami. Fifth pair of legs with a poorly developed terminal segment of the exopodite, which bears only two unequal apical spines. Length, 1.2 mm.

Male. Smaller than the female. Fifth pair of legs with both endopodites simple, one segmented, that of the right leg being larger than that of the left; the second basal segment of the left leg projects inwardly to a sharp point, both exopodites slender and provided with slender curved spines.

Distribution.—This small species is the commonest found in the State and is widely distributed. A few specimens were bred in an aquarium prepared with dried mud from Bringagee. N.S.W.: Kendall, Epping, Parramatta, Botany, Waterloo Swamps, University Pond, Lane Cove, Yarrangobilly, Bringagee, Corowa; Victoria.

BOECKELLA ROBUSTA SAWS.

Sars, Arch. Math. og Naturvid., 18, 1896, Plate 8, figs. 1-4.

Female. Cephalothorax robust, the greatest breadth occurring in front of the middle, slightly tapering posteriorly; lateral expansions of the last segment

with the outer lobes broad, extending beyond the first abdominal segment and terminating in points which are bent outwards, inner lobes very small and acute. Abdomen comparatively short, not half as long as the cephalothorax; genital segment long, asymmetrical, the right side protruding more than the left; caudal rami equal in length to the two last segments combined. Antennules short, scarcely exceeding the length of the cephalothorax. Fifth pair of legs with a well developed exopodite, the terminal segment small but armed with seven spines, endopodite almost reaching the end of the second segment of the exopodite. Length, 3.2 mm.

Male. Right antennule much swollen. Fifth pair of legs somewhat like those of the preceding species; in the right leg the spines of the exopodite are unequal, that of the second segment being longer than the first; endopodite tapering to a point and bearing a small curved bristle near its base; basal segment of the left leg produced inwardly to a point as in the preceding species, endopodite extremely small.

A single male specimen was bred from dried mud collected at Bringagee, which closely resembled this species. In the formation of the fifth pair of legs (Pl. Iviii., figs. 7-9) the following differences were noted: the endopodite of the right leg was tipped with a short but distinct denticle, and was also armed with a straight upturned spine at the base, instead of the curved bristle, characteristic of *B. robusta*; in the left leg, the inward projections of the basal segment and the endopodite were of almost equal size and both rounded. Unfortunately no female specimens were obtained, so that it is impossible to decide whether this form is a variety of *B. robusta* or a distinct species.

Distribution.—N.S.W.: Sydney, Bringagee; Tasmania.

BOECKELLA PSEUDOCHELES Searle.

Searle, Viet. Nat., 28, 1912, p. 198, Plate v., figs. 1-9.

Female. Cephalothorax robust, broadly oval, tapering slightly anteriorly, lateral expansions of the last segment large, outer lobes extending almost to the base of the first abdominal segment, tips pointed and directed outwards, inner lobes very small. Abdomen short, genital segment short and broad, asymmetrical, the right side bulging more than the left, not very protuberant ventrally; second segment very small; caudal rami and setae short. Antennules short, extending, when reflexed, to the end of the cephalothorax. Fifth pair of legs with the curved process, on the second segment of the exopodite, comparatively small, terminal segment well developed and armed with seven spines. Length, 2.4 mm.

Male. Right antennule strongly hinged, the penultimate segment produced anteriorly. Fifth pair of legs of unusual form, the left leg with a small rounded lobe on the inner side of the second basal segment, exopodite with the last segment bearing two spines, endopodite small and flattened; right leg with a comparatively small apical claw, which ends in two unequal points, endopodite long and slender, extending beyond the second segment of the exopodite, its shape peculiarly characteristic, being inwardly produced at the base, somewhat swollen in the middle and blunt at the apex.

This species has not before been recorded in New South Wales.

Distribution.—N.S.W.: Holbrook; Victoria.

Genus GLADIOFERENS Henry, 1919.

Lateral expansions of the last segment of the cephalothorax reduced. Abdomen consisting of four segments in the female, five in the male. Caudal rami

long and slender. Natatory legs biramous, each ramus consisting of three segments, fourth pair in the female with a long curved spine on the inner side of the basal segment. Fifth legs in the male with the terminal segment of the exopodite armed with one spine in the right leg and several short spines in the left leg. Ovisac present.

Two species known, both from New South Wales.

Key to species of Gladioferens.

A. Both rami of the 5th pair of legs in the male composed of three segments.

AA. Endopodites of the 5th pair composed of less than three segments. *brevicornis*.
spinus.

GLADIOFERENS SPINOSUS Henry.

Proc. Roy. Soc. N.S.W., liii., 1919, p. 32, Plate 1, figs. 1-7.

Distribution.—N.S.W.: Kendall, Waterfall, National Park.

GLADIOFERENS BREVICORNIS Henry.

Proc. Roy. Soc. N.S.W., liii., 1919, p. 35, Plate 2, figs. 10-12.

Distribution.—N.S.W.: Cumbalum.

Genus HEMIBOECKELLA Sars, 1912.

Lateral parts of the last segment of the cephalothorax not expanded. Abdomen composed of three segments in the female, five in the male. Caudal setae, of unequal length, are attached to the outer edge. Right antennule of the male hinged and with large conspicuous aesthetases. Antennae with the endopodite imperfectly defined from the basal part. Natatory legs with both rami three segmented, terminal joint of the exopodite with two spines on the outer side. Fifth legs in the male unequal, left leg shorter than the right, endopodites of both legs distinctly segmented.

Only one species is known.

HEMIBOECKELLA SEARLI Sars.

Sars, Arch. Math. og Naturvid., 32, 1912, Plate ix., figs. 1-14.

Female. Cephalothorax moderately slender, tapering anteriorly and posteriorly. Head projecting into a well defined rostrum, divided at the end into two lappets. Abdomen short, genital segment symmetrical, narrowing towards the base, greatly protuberant ventrally; caudal rami divergent, inner edges ciliated, caudal setae of unequal length, the middle one exceeding the length of the whole abdomen. Antennules short, barely exceeding the cephalothorax. Fifth pair of legs with well developed exopodites, curved process of the second segment coarsely denticulated, terminal segment bearing three spines and three setae; endopodite reaching beyond the second segment of the exopodite. Length, 1.6 mm.

Male. Right antennule provided with numerous large and conspicuous aesthetases. Fifth pair of legs, basal segment of the left leg produced into a large triangular projection, endopodite two-segmented, provided with a single seta; exopodite also two-segmented, first segment bearing a single spine, second segment with a simple terminal spine, a much smaller spine and a curved denticle. Right leg with a three segmented exopodite, each segment bearing a short spine; endopodite three-segmented, the second segment being produced inwardly into a long slender process.

Distribution.—This species has not hitherto been recorded from New South Wales; both males and females were abundant in a collection from Holbrook. Sars described it from specimens sent from Victoria.

Division 2. *CYCLOPOIDA.*

Cephalothorax much broader than the abdomen. Articulation occurring between the 4th and 5th free segments. Both antennules transformed in the male. Antennae usually devoid of exopodites. Fifth pair of legs rudimentary. Heart absent. Ova carried in two ovisacs which are attached laterally or sub-dorsally. There is only one free-swimming freshwater family.

Family *CYCLOPIDAE.*

Antennules composed of a varying number of segments, never exceeding seventeen. Antennae four-segmented, with an elongated seta at the end of the first segment. Natatory legs well developed, last pair of legs small and alike in the two sexes.

All the freshwater forms included in this family are classed by most authors in the one genus *Cyclops*. This genus, however, comprises so many species that several attempts have been made to separate them into groups. Sars in his *Crustacea of Norway* (1913) has gone further than this and has divided the old genus *Cyclops* into five genera; this classification appears to be a natural one and has been followed in this work.

Key to genera of the Cyclopidae.

- A. 5th pair of legs composed of two segments.
 - B. Distal segment armed only with setae. *Mesocyclops*.
 - BB. Distal segment armed with setae and spines.
 - C. One lateral spine. *Cyclops*.
 - CC. Two spines. *Pachycyclops*.
- AA. 5th pair of legs composed of a trilobate lamella.
 - B. Lamella armed with one seta and one spine. *Leptocyclops*.
 - BB. Lamella armed with two setae and a spine or three spines.
 - Platycyclops*.

Genus *CYCLOPS* Muller, 1776. (As restricted by G. O. Sars.)

Lateral parts of the three anterior segments of the cephalothorax well defined, last segment produced laterally. Abdomen slender, with the genital segment of the female dilated in front. Antennules of varying length, strongly hinged in the male. Antennae with all four segments well defined. Rudimentary palp of the mandibles with two long, plumose setae and a short bristle. Natatory legs with both rami composed of three segments, sometimes only two, endopodites of the fourth pair with two apical spines. Fifth pair very small, composed of two segments, distal segment not expanded and provided with an apical seta and a lateral spine. Seminal receptacle usually oval in shape.

Two species are known in New South Wales.

Key to species of Cyclops.

- A. All natatory legs with both rami two segmented. *varicans*.
- AA. 1st pair with both rami two-segmented, remaining pairs with both rami three-segmented. *australis*.

CYCLOPS AUSTRALIS (King).

Syn.—*C. sydneyensis* Schmeil.

This species was mentioned by King (1854) but no description or illustration was given, merely the name and locality "in all ponds"; since this was the only *Cyclops* mentioned by King, he probably united several species under the one name. Sars (1896, p. 74) briefly described a species of *Cyclops* from Australia under this name, it being the only unknown member of the genus in a collection sent to him from the neighbourhood of Sydney. The species was not figured until 1908 when Sars published detailed drawings (Plate iii., figs. 5-18).

Female. Cephalothorax oval in outline, tapering more posteriorly than anteriorly. Abdomen equal in length to two-thirds of the cephalothorax, its genital segment almost attaining the length of the three succeeding segments combined; caudal rami elongated, slender, exceeding the length of the last two segments combined, innermost apical seta very slightly longer than the outermost. Antennules very little longer than the first segment of the cephalothorax, consisting of twelve segments of which the 8th and 9th are unusually long. Both rami of the 1st pair of legs two-segmented, those of the three succeeding pairs three-segmented. Fifth pair with the basal segment marked only by a seta, terminal segment small, provided with a seta and a very small denticle. This is the largest Australian *Cyclops* known, the adult female attaining a length of from 2 to 2.5 mm.

Distribution.—N.S.W.: Byron Bay, Kendall, Centennial Park, Bourke Street, Waterloo Swamps, University Pond, Holbrook, Corowa; Victoria; South Australia.

CYCLOPS VARICANS Sars.

Sars, Christ. Videns. Sels. Forh., 1862, p. 43, Plate xxxiii.

Female. Cephalothorax moderately robust, oval in outline, the greatest width occurring in the middle; last segment slightly expanded laterally. Abdomen greater than half the length of the cephalothorax; the genital segment narrowing posteriorly; caudal rami very slightly divergent, equal in length to the last two segments combined, the innermost seta very much longer than the outer. Antennules composed of twelve segments, shorter than the first segment of the cephalothorax. Natatory legs with both rami two-segmented, endopodites of the 4th pair with both apical spines well developed. Fifth pair of legs with the proximal segment much reduced, its presence only marked by a seta, distal segment small, its seta long and slender and with a minute spinule on the inner edge. Length, .85 mm.

Distribution.—This species has never before been recorded from Australia. N.S.W.: Moss Vale, Berrima; New Zealand; North America; Africa; Turkistan; Europe.

Genus PACHYCYCLOPS Sars, 1914.

Lateral parts of the cephalothoracic segments not produced laterally, last segment very small. Abdomen moderately slender, genital segment only slightly dilated in front; caudal rami comparatively short, apical setae well developed. Antennules long and slender, composed of seventeen segments. Natatory legs with both rami composed of three segments; terminal segment of exopodite in 1st-3rd pairs with three spines outside, in 4th pair with two spines. Fifth pair two-segmented, proximal segment with a slender seta, distal segment short, armed

with two unequal spines and a long seta. Seminal receptacle more or less bipartite.

This genus corresponds to Schmeil's "*fuscus-albidus*" group. One species is present in N.S.W.

PACHYCYCLOPS ANNULICORNIS (Koch).

Syn.—*C. quadricornis albidus* Jurine, *C. tenuicornis* Claus, *C. albidus* Schmeil, *C. gyrinus* Forbes.

Described by Koch in 1835, first recorded from Australia by Sars (1896) and figured in 1908 (Plate iii., figs. 1-4).

Female. Cephalothorax broadly oval in outline, the greatest width exceeding half the length. Abdomen long, genital segment cylindrical, equal to the combined length of the three succeeding segments; caudal rami short. Antennules long and slender, reaching beyond the third segment of the cephalothorax, composed of seventeen segments, of which the 2nd and 3rd, 10th and 11th are usually darker in colour than the other segments. Antennae with a very long and slender terminal segment. Natatory legs with the terminal segment of the endopodite of the fourth pair distinguished by the rudimentary distal seta. Fifth pair with the distal segment much smaller than the proximal. Length, 1.8 mm.

Distribution.—This species has a world-wide distribution and is very common in this State. A solitary specimen was raised from dried mud collected at Corona. N.S.W.: Kendall, Bangalow, Pt. Stephens, Parramatta, Five Dock, Centennial Park, National Park, Waterfall, Berrima, Yass, Bringagee; Victoria; South Australia; Hawaii; Asia; Africa; Europe; North and South America.

Genus MESOCYCLOPS Sars, 1914.

Cephalothoracic segments scarcely prominent laterally; last segment very small and not produced laterally. Abdomen slender, genital segment elongated, slightly dilated anteriorly; caudal rami of moderate length or very short. Antennules long and slender, usually composed of seventeen segments. Antennae with the apical setae long and curved. Natatory legs with both rami three-segmented, terminal segment of the exopodite with only two spines outside, terminal segment of the endopodite unusually long. Fifth pair very small, two-segmented, the distal segment carrying two slender setae. Seminal receptacle bilobed anteriorly, the posterior portion somewhat tongue-shaped.

This genus corresponds to Schmeil's "*leuckarti*" group. One species occurs in New South Wales.

MESOCYCLOPS OBSOLETUS (Koch).

Syn.—*C. leuckarti* Claus, *C. simplex* Poggendorff, *C. scourfieldi* Brady.

First described by Koch in 1835 and recorded from Australia by Sars in 1896. In 1908 Sars described a special variety *australiensis* for the Australian form.

Female. Cephalothorax slender, more so than in the typical European form, first segment unusually large and the last very small. Abdomen long and slender, genital segment produced and equal to the length of the three succeeding segments combined; caudal rami less divergent and longer than in the typical form, sometimes slightly exceeding the length of the last two segments combined. Antennules composed of seventeen segments, long and slender, attaining the end of the third segment. Natatory legs with the spines of the exopodites very coarse. Fifth pair with a narrow distal segment, setae long and slender. Length, 1.3 mm.

Distribution.—N.S.W.: Kendall, Hornsby, Centennial Park, Bourke Street, Bringagee, Holbrook; Victoria; Hawaii; Asia; North and South America; Africa; and throughout Europe.

Genus *LEPTOCYCLOPS* Sars, 1914.

Segments of the cephalothorax produced laterally, rounded at the ends; last segment short and broad, produced on each side to a rounded hairy lobe. Abdomen slender, genital segment short; caudal rami more or less elongated. Antennules composed of twelve segments, the outer ones very slender. Natatory legs with both rami three-segmented, armed as in the genus *Pachycyclops*. Fifth pair of legs formed by a trilobate lamella armed with a denticulated spine and two setae. Seminal receptacle with the posterior part not produced, forming two transverse bands. This genus comprises the species of Schmeil's "*serrulatus-prasinus*" group.

Two occur in New South Wales.

Key to species of Leptocyclops.

- A. Antennules reaching the end of the second segment of the cephalothorax. *agilis*.
 AA. Antennules reaching past the third segment of the cephalothorax. . . *viridis*.

LEPTOCYCLOPS AGILIS (Koch).

Syn.—*C. serrulatus* Fischer, *C. varius* var. *brachyura* Lilljeborg.

Described by Koch in 1835, first recorded from Australia by Sars (1896).

Female. Cephalothorax slender, oval in outline. Abdomen slender, equal to two-thirds of the cephalothorax in length; genital segment dilated at the base, equal to the combined length of the two succeeding segments; caudal rami of moderate length, equalling the two preceding segments, diverging at the ends, outer edges denticulated. Antennules composed of twelve segments, long and slender, reaching the end of the second segment of the cephalothorax. Fifth pair of legs with a large, coarsely dentate, inner spine. Length, 1 mm.

Distribution.—This is the commonest "*Cyclops*" found in New South Wales, and is distributed practically throughout the State. Some specimens were raised from dried mud collected at Meryula Station near Cobar, N.S.W., Byron Bay, Dorrigo, Bangalow, Kendall, Moss Vale, Berrima, Bong Bong, Yarrangobilly, Lett River, Leura, Orange, Epping, Lane Cove, Parramatta, Five Dock, Botany; Victoria; New Zealand; New Guinea; Hawaii; Azores; Polar Island; Africa; North and South America and throughout Asia and Europe.

LEPTOCYCLOPS VIRIDIS Henry.

Proc. Roy. Soc. N.S.W., liii., 1919, p. 40, Plate 2, figs. 8-9.

Distribution.—N.S.W.: Kendall, Hornsby, Epping.

Genus *PLATYCYCLOPS* Sars, 1914.

Cephalothoracic segments expanded laterally; last segment short and broad, with its lateral parts more or less densely hairy. Abdomen robust, genital segment short; caudal rami of different shape in the different species. Antennules short, with the number of segments reduced. Natatory legs with the basal part broad, both rami three-segmented and of almost equal length, middle segment of the endopodite with a single seta inside. Fifth pair sometimes well defined, formed by a small lamella bearing two setae and a spine or this replaced by three spines. Seminal receptacle short and broad.

This genus comprises a somewhat heterogeneous collection of forms; it corresponds to Schmeil's "*phaleratus-affinis-fimbriatus*" group. Three species occur in New South Wales.

Key to species of Platycyclops.

- A. Caudal rami short, not attaining the length of the last two abdominal segments combined.
 B. 5th pair of legs represented on each side by three spines. . . *phaleratus*.
 BB. 5th pair, each consisting of a lamella bearing a spine and two setae.
affinis.
 AA. Caudal rami long, exceeding the length of the last two segments combined.
fimbriatus.

PLATYCYCLOPS PHALERATUS (Koch). (Plate lviii, fig. 1-2.)

Syn. *C. canthocarpoides* Fischer, *C. lascivius* Poggenpol.

Described by Koch in 1835, first recorded from Australia by Sars (1896).

Female. Cephalothorax short and broad, the greatest width occurring about the middle and equal to two-thirds of the length; lateral parts of the last segment produced, hairy. Abdomen strongly built, the posterior edges of all the segments denticulated; genital segment short and broad, scarcely as long as the next two segments combined; caudal rami short, bearing rows of spines. Antennules much shorter than the first segment of the cephalothorax, composed of ten segments. Natatory legs with a broad basal segment; in the 1st, 2nd and 3rd pairs, the terminal segment of the exopodite bears three coarse spines outside, the 4th pair bears only two. Fifth pair replaced on each side by three ciliated spines attached to the lateral corners of the corresponding segment. Length, 1.1 mm.

Distribution.—N.S.W.: Kendall, Berrima, University, Centennial Park, Botany; New Guinea; Ceylon; Turkistan; Europe; North and South America.

PLATYCYCLOPS AFFINIS Sars. (Plate lviii, fig. 3-4.)

Syn. *C. pygmaeus* Reberg.

Described by Sars in 1863 (p. 47) and first recorded by him from Australia in 1896.

Female. Cephalothorax narrower than in the preceding species, first segment very long, last segment with the lateral parts slightly produced, bearing spinules. Abdomen with the genital segment slightly dilated at the base; caudal rami longer than in the preceding species. Antennules shorter than the first segment of the cephalothorax and composed of eleven segments. Natatory legs with the basal part narrower than in *P. phaleratus*, the terminal segment of the exopodite in the 1st and 2nd pairs with three spines outside, in 3rd and 4th pairs with only two. Fifth pair well defined, consisting of a small lamella bearing a slender spine, and outside a seta of the same length and in the middle a smaller seta. Length, .75 mm.

Distribution.—This is a comparatively rare species in New South Wales; it has only been found near Sydney and at Mt. Koseinsko. It occurs in China and Turkistan and throughout Europe.

PLATYCYCLOPS FIMBRIATUS (Fischer). (Plate lviii, figs. 5-6.)

Syn. *C. crassicornis* Sars.

Described by Fischer in 1853 (p. 94), first recorded from Australia by the present author in 1919.

Female. Cephalothorax somewhat more robust than the preceding species; first segment much longer than the four succeeding segments combined; last segment with the lateral parts produced, bearing stiff hairs. Abdomen equal to two-thirds of the cephalothorax in length, genital segment longer than the combined length of the two succeeding segments, slightly dilated at the base; caudal rami much longer than in the two preceding species, narrow, slightly divergent. Antennules short and thick, composed of eight segments. Natatory legs similar to those of *P. phaleratus*. Fifth pair composed of a small lamella, bearing a comparatively short spine and two slender setae. Length, .9 mm.

Distribution.—N.S.W.: Kendall, Five Dock, Centennial Park; New Guinea; Hawaii; Ceylon; North and South America; Europe.

Division 3. HARPACTICOIDA.

Body slender, more or less cylindrical, no distinct demarcation between the cephalothorax and abdomen. Last segment of the cephalothorax articulates with the preceding segment and is firmly attached to the first abdominal segment. Antennules small, rarely more than eight segments, both prehensile in the male. First pair of legs either similar to the succeeding pairs or transformed into grasping organs; three succeeding pairs natatory; fifth pair reduced, never natatory. Heart absent. Ova in a single ovisac attached ventrally or, more rarely, in two ovisacs.

The great majority of freshwater Harpacticids belong to the *Canthocamptidae* and this is the only family represented in Australia. This is the first record of the presence of members of this division in New South Wales.

Family CANTHOCAMPTIDAE.

Rostrum very small. Antennules usually composed of eight segments though the number may be reduced, distinctly hinged in the male. First pair of legs more or less prehensile, endopodites usually longer than exopodites; three succeeding pairs with exopodites always longer than endopodites which are sometimes reduced; fifth pair in the female more or less lamellar with the distal segment well defined and the proximal segment expanded inside. A single ovisac present.

This family comprises four genera that include true freshwater forms; two of them are represented in New South Wales.

Key to genera of Canthocamptidae.

- A. Antennules composed of 8 segments.
 - .B. Endopodites of the 2nd and 3rd pairs of legs composed of three segments.
 - Canthocamptus*.
 - BB. Endopodites of 2nd and 3rd pairs composed of two segments. *Attheyella*.
- AA. Antennules composed of less than 8 segments.
 - B. Antennules 7-segmented. *Morarina*.
 - BB. Antennules 6-segmented. *Marshia*.

GENUS ATTHEYELLA Brady, 1880.

Body slender, cephalothorax very little broader than the abdomen. Rostrum very small. Antennules comparatively short, eight-segmented. Antennae with the basal portion not subdivided, exopodite generally one-segmented, bearing two apical and two lateral setae. First pair of legs imperfectly prehensile, endo-

podite usually two-segmented, scarcely longer than the exopodite, rarely three-segmented and more elongated; endopodites of the three succeeding pairs reduced, two-segmented, the first segment very small, that of the third pair in the male transformed.

This genus comprises thirteen species, one of which is present in New South Wales.

ATTHEYELLA AUSTRALICA Sars.

Sars, Arch. Math. og Naturvid., 29, 1908, Plate iv., figs. 9-26.

Female. Cephalothorax moderately robust, with the first segment equal to the combined length of the next three segments. Rostral projection absent. Abdomen shorter than the cephalothorax, the ventral margins of the segments bearing coarse spinules and with groups of spinules at the sides. Anal opercle smooth; caudal rami divergent, narrowed at the tips; their inner edges bearing hairs; two slender setae on the outer edge, each accompanied by a cluster of spinules, middle apical seta very long, inner seta about half as long as the outer; the dorsal surface of each ramus bearing a well-marked carina and with a slender seta situated on a small prominence. Antennules slender, the last segment being the longest. First pair of legs with both rami composed of three segments, the exopodite reaching the end of the second segment of the endopodite. Fifth pair of legs with the inner apical seta much the longest, the proximal segment with a short triangular expansion bearing six setae. Length, .67 mm.

Male. Smaller than the female. Fifth pair of legs very small, the expansion of the proximal segment bearing two spines.

Distribution.—N.S.W.: Kosciusko, Holbrook; Victoria.

Genus MORARIA Scott, 1893.

Syn. Ophiocamptus Mrazek.

Segments of the body very distinct. Rostral projection prominent. Anal opercle angularly produced posteriorly. Caudal rami large, with two slender bristles outside. Antennules in the female composed of seven segments, strongly hinged in the male. Antennae with a small, one-segmented exopodite. Legs short, with the natatory setae imperfectly developed; first pair not very different from the three succeeding pairs, the endopodites of the latter are two-segmented and shorter than the exopodites. Fifth pair with the proximal segment expanded inside.

This genus consists of eight species, one of which is present in New South Wales.

MORARIA LONGISETA, n.sp. (Pl. lvi., fig. 3; Pl. lvii., figs. 1-7.)

Female (Pl. lvii., fig. 1). Body fairly robust, without any sharp demarcation between the cephalothorax and abdomen; first segment large, longer than the next three segments combined. Abdomen with the boundary line between the first two segments clearly defined. Rostrum small. Posterior margins of all the segments strongly serrated (Pl. lvii., fig. 3), the serrations being of very irregular size and shape; in addition the segments each bear a row of spinules, very short and fine in the cephalothorax but becoming longer and stronger in the posterior segments; the lateral parts of the segments slightly produced, each bearing a strong short denticle, those of the abdomen also provided with a group of spinules. Anal opercle smooth, with a triangular projection behind, the margin of which is fringed with hairs (Pl. lvii., fig. 5); caudal rami about the length

of the last segment, distinctly keeled dorsally and bearing a seta about the middle of the dorsal surface; two long setae situated on the outer edge, each accompanied by a cluster of spinules; middle apical seta exceptionally long for the genus, outer seta of moderate size, inner one very small and slender. Antennules composed of seven segments, the outer portion including only three segments. Both rami of the first pair of legs (Pl. lvii., fig. 6) composed of three segments, the exopodite scarcely reaching beyond the first segment of the long endopodite; the second pair (Pl. lvii., fig. 4) has a long three-segmented exopodite and a short two-segmented endopodite, the first segment of the latter being very small, the 3rd and 4th pairs have also long three-segmented exopodites, and two-segmented endopodites but the second segments are shorter than those of the second pair. The fifth pair (Pl. lvi., fig. 3) is well developed, the inner expansion of the proximal segment being large and bearing 6 long setae. Length, .70 mm.

Male. Smaller than the female, only attaining a length of .55 mm. Antennules (Pl. lvii., fig. 7) transformed into hinged grasping organs. The three-segmented exopodite of the first two pairs of legs comparatively long and provided with long setae, the endopodite of the first pair is long and three-segmented, that of the second is very short and two-segmented; in the third pair the exopodite is three-segmented and is short and stout, the endopodite is also three-segmented, the second segment bearing an extremely long seta on the inner side and the slender terminal segment bearing two long setae. Fifth pair of legs small, the inner expansion of the proximal segment bearing two unequal setae.

This species is in some respects nearer to the genus *Attheyella* than to *Moraria*, especially in the long, well-developed caudal setae and in the structure of the first pair of legs; it is true to the genus *Moraria*, however, in the possession of a triangular expansion behind the anal opercle and in having antennules composed of only seven segments. There is no doubt that the two genera are closely allied.

Distribution.—N.S.W.: Holbrook.

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EXPLANATION OF PLATES LV.-LVIII.

Plate lv.

Boeckella coronaria.

Fig. 1.—Female (x 50); Fig. 2.—♀ lappets (x 50); Fig. 3.—♀, exopodite, 5th pair of legs (x 270); Fig. 4.—♀, antennule (x 64); Fig. 5.—♂, right leg of 5th pair (x 318); Fig. 6.—♂, left leg of 5th pair (x 318); Fig. 7.—♂, right antennule (x 64).

Plate lvi.

Figs. 1-2. *Boeckella fluvialis.*

Fig. 1.—Female (x 25); Fig. 2.—♀, lappets (x 64).

Fig. 3. *Moraria longiseta.*

♀, 5th pair of legs (x 270).

Figs. 4-6. *Boeckella fluvialis.*

Fig. 4.—♂, left leg of 5th pair (x 230); Fig. 5.—♂, right leg of 5th pair (x 230); Fig. 6.—♂, right antennule (x 64).

Plate lvii.

Moraria longiseta.

Fig. 1.—Female (x 64); Fig. 2.—♀, antennule (x 270); Fig. 3.—♀, margin of the 1st segment (x 270); Fig. 4.—♀, leg of 2nd pair (x 270); Fig. 5.—♀, end of the abdomen (x 270); Fig. 6.—♀, leg of 1st pair (x 270); Fig. 7.—♂, antennule (x 270).

Plate lviii.

Figs. 1-2. *Platycyclops phaleratus*.

Fig. 1.—Female (x 62); Fig. 2.—♀. 5th leg (x 186).

Figs. 3-4. *Platycyclops affinis*.

Fig. 3.—Female (x 96); Fig. 4.—♀. 5th leg (x 200).

Figs. 5-6. *Platycyclops fimbriatus*.

Fig. 5.—Female (x 62); Fig. 6.—♀. 5th leg (x 186).

Figs. 7-9. *Boeckella robusta*.Fig. 7.—♂. right leg of 5th pair (x 98); Fig. 8.—♂. left leg of 5th pair (x 98);
Fig. 9.—♂. endopodite of right leg (x 440).